



PD-01W120

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of)
GABOR DEVENYI) GAU: 3682
Ser. No. 10/084,704) Examiner:
Filed: February 26, 2002) Colby Hansen
For: LEADSCREW ASSEMBLY WITH A WIRE-WOUND)
LEADSCREW AND A SPRING-PIN ENGAGEMENT)
OF A DRIVE NUT TO THE LEADSCREW)

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant files its Appeal Brief in triplicate, together with a Fee Transmittal authorizing the charging of the required fee. A Notice of Appeal and fee were previously filed.

Real Party in Interest

The Real Party in Interest is the assignee, Raytheon Company.

Related appeals and interferences

Applicant is not aware of any related appeals and/or interferences.

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Status of claims

Claims 1-17 were filed. During prosecution, claims 10, 12, and 17 were amended; claim 16 was canceled; and new claims 18-21 were added. Claims "1-15" and "17-21" were finally rejected in a final Office Action dated March 8, 2004 (hereinafter "final Office Action"). Claims 1-15 and 17-21 are appealed, subject to the clarification requested in the next paragraph.

During the preparation of the Appeal Brief, Applicant noticed for the first time that the Examiner has not stated any ground of rejection for claims 15, 18, and 19. Applicant asks that the Examiner indicate the status of claims 15, 18, and 19 in the Examiner's Answer.

A clean copy of the appealed claims 1-15 and 17-21 is in the Appendix.

Status of amendments

A Response to Office Action was filed responsive to the final Office Action, but the claims were not amended.

Summary of claimed subject matter

Background

A leadscrew assembly is a device that converts a rotational mechanical movement, such as produced by a conventional electric motor, to a linear movement, such as required by some types of mechanical devices. A conventional leadscrew assembly includes an externally threaded leadscrew and an internally threaded follower engaged to the externally threaded leadscrew and constrained against rotation. As the leadscrew turns, the internally threaded follower rides along the externally threaded leadscrew and moves parallel to the long direction of the leadscrew. The movement of the leadscrew assembly is reversible, so that the follower can move in either direction

by reversing the rotation of the motor.

Conventional practice is to machine the threads on the leadscrew and on the follower. Machining precision threads is expensive. US patent 5,636,549 discloses another approach to making the external thread on the leadscrew, using a round wire wound onto the leadscrew. The '549 patent also discloses another approach for the follower, wherein a ball-bearing set arranged at an angle rides in the groove of the wound wire (see Figure 4 of the '549 patent).

This approach, while an improvement on the conventional approach, still is not optimal. It permits the transmission of far more mechanical drive force to the follower than is needed for a leadscrew assembly that is used in light-duty applications, where the follower moves a light load and/or moves slowly. The present invention deals with a leadscrew assembly that is particularly suited for such light-duty applications. (The preceding paragraphs summarize the Background found at para. [0002]-[0005] of the Specification.)

Present Invention

The present invention is recited in claim 1, illustrated in Figure 1, and described at para. [0016]-[0021] of the Specification. A leadscrew assembly 20 includes a leadscrew 22 that may be formed by wrapping a thread wire 46 around an elongated shaft 40 to form a leadscrew thread 44. A follower includes a hollow drive nut housing 26 with an unthreaded inner surface 52. Preferably, the drive nut housing 26 is constrained so that it does not rotate (claims 10, 12-17, 20). The leadscrew 22 is inserted through the nut bore 50 in the drive nut housing 26. The nut bore 50 is sufficiently large in diameter that the leadscrew 22 may rotate unhindered in the nut bore. The drive nut housing 26 is engaged to the leadscrew 22 by a spring pin 54 whose ends 56, 60 are engaged to the drive nut housing so that the central portion 58 of the spring pin 54 spans across the open portion of the drive nut housing 26 and engages the leadscrew thread 44 over a fraction of a turn of the leadscrew thread 44.

With this approach, the drive nut housing 26/follower may be driven in either

direction by the reversible rotation of the leadscrew 22. The force that may be transmitted through the combination of the wound thread wire 46 that forms the leadscrew thread 44 and the wire spring pin 54 spanning the drive nut housing 26 is limited due to possible deformation of either of the wires if the transmitted force becomes too high. However, the leadscrew assembly 20 having this structure is inexpensive to produce and fully suitable for light-duty applications where the transmitted forces are not too great.

Grounds of rejection to be reviewed on appeal

Ground 1. Claims 1-7, 9, 10, 12-13, and 20 are rejected under 35 USC 103 over Beery US Patent 3,654,816 in view of Devenyi US Patent 5,636,549.

Ground 2. Claims 8 and 14 are rejected under 35 USC 103 over Beery in view of Devenyi '549 and further in view of Devenyi US Patent 5,533,417.

Ground 3. Claims 11, 17, and 21 are rejected under 35 USC 103 over Beery in view of Devenyi '549, and further in view of Pan US patent 6,459,844.

Argument

Ground 1. Claims 1-7, 9, 10, 12-13, and 20 are rejected under 35 USC 103 over Beery US Patent 3,654,816 in view of Devenyi US Patent 5,636,549.

Claims 1-7 and 9

Claim 1 recites in part:

"A leadscrew assembly comprising:
a leadscrew..."

Beery does not teach a leadscrew assembly. Beery contrasts his approach with a leadscrew, which is a bidirectional device driven by a reversible motor. See col. 1, lines 20-28. Beery teaches that his device uses a unidirectionally driven screw, see col. 1, lines 41-44. Beery teaches a pressure-maintaining device for a document stack in a document feeder (col. 3, line 55-col. 4, line 30), that achieves bidirectional movement with one direction being driven by a unidirectional motor and the other direction being achieved by disengaging the screw from the driven assembly and manually moving the document feeder on a ratcheting mechanism. The engagement is between a helically coiled spring 10 (Figs. 2-3; col. 2, lines 21-69) mounted in a rotatable housing 12, and a machined screw 16, which must have an asymmetric profile for the device to operate (col. 3, lines 20-40; Figures 2, 4). The use of a symmetrically shaped thread would render Beery's device be inoperable. The rotatable housing is required for the helically coiled spring to function (col. 2, lines 39-45). If the housing were not rotatable, the device of Beery would be inoperable.

Devenyi '549 teaches a wire wound leadscrew with a symmetrically shaped wire thread. Devenyi '549 further teaches that the leadscrew follower structure illustrated in Figure 4 and discussed at col. 4, line 22-col. 5, line 35 includes a structure supporting ball bearings 33, 34 with balls 41. The balls 41 of the ball bearings 33, 34 ride on the thread 32 of the leadscrew 31. This structure ensures the achieving of a primary objective of the invention, that "...there is only a rolling contact between the components. Therefore the wear is minimal..." (col. 5, lines 10-12) The approach of Devenyi '549 is distinguished in para. [0005] of the present application: "The approach of the '549 patent is operable for many applications but is not optimal for other applications such as those requiring light duty, low loads, and low speeds of operation. There is a need for realizing the advantages of the basic approach disclosed in the '549 patent, but in a form more suitable to these other applications."

MPEP 2143.01 provides that, in constructing a sec. 103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2143.02 requires that, in combining the teachings of two references, there must be a reasonable expectation of

success in the combination. Both of these mandates are violated in the proposed approach of substituting the wire-wound leadscrew of Devenyi for the asymmetric-thread-profile screw of Beery. Beery requires that the thread profile of the screw 16 be asymmetric so that the "...spring member 10 and housing 12 is slidable or ratchetable in one direction along the screw while being substantially resistant to movement in the other direction." (col. 3, lines 21-24) Using the round-shape wire-wound leadscrew of Devenyi would render the approach of Beery inoperable as thus described. There would consequently be no expectation of success for the document-feeding device of Beery to function as described in Beery, if the wire-wound leadscrew of Devenyi were used in place of Beery's asymmetric-thread screw. On the other hand, if the proposed approach is to modify the device of Devenyi '549 with a follower structure as in Beery, the advantages of Devenyi '549 would be lost: the contact between the leadscrew threads and the leadscrew follower would not be limited to a rolling contact.

One cannot discount the requirement of the asymmetric-profile screw in Beery, as this is one of the central teachings of Beery to achieve one of the objects of the invention: "...to provide a screw engagement device in combination with a particular type of screw in which the engaged device is ratchetable in one direction along the screw" (col. 1, lines 58-62) and implemented "In accordance with a further aspect of the invention..." (col. 3, lines 20-25). The selective use of only the helpful teachings of a reference, and not giving weight to the overall teachings of the reference, in this manner is a per se hindsight reconstruction. Such an approach is not proper. In In re Mercer, 185 USPQ 774, 778 (CCPA 1975), the CCPA stated:

"The relevant portions of a reference include not only those teachings which would suggest particular aspects of an invention to one having ordinary skill in the art, but also those teachings which would lead such a person away from the claimed invention. See In re Lunsford, 53 CCPA 986, 357 F.2d 380, 148 USPQ 716 (1966)."

"The Board's approach amounts in substance, to nothing more than a hindsight 'reconstruction' of the claimed invention by relying on

isolated teachings of the prior art without considering the over-all context within which those teachings are presented. Without the benefit of appellant's disclosure, a person having ordinary skill in the art would not know what portions of the disclosure of the reference to consider and what portions to disregard as irrelevant, or misleading. See *In re Wesslau*, 53 CCPA 746, 353 F.2d 238, 147 USPQ 391 (1965)."

The present rejection seeks to perform a hindsight reconstruction based upon unrelated references, which is technically unsupported and is legally improper. Applicant has demonstrated above that the proposed combination of the teachings of the references is not technically compatible and would render the devices of the two references inoperable.

The case authority and the MPEP provide guidance on the legal issue. The present rejection is a sec. 103 combination rejection. It is well established that a proper sec. 103 combination rejection requires more than just finding in the references the elements recited in the claim (but which was not done here). To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2143 and 2143.01. See also, for example, *In re Fine*, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed.Cir. 1988), *In re Laskowski*, 10 USPQ2d 1397, 1398 (Fed.Cir. 1989), *W.L. Gore & Associates v. Garlock, Inc.*, 220 USPQ 303, 311-313 (Fed. Cir., 1983), and *Ex parte Levengood*, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); *Ex parte Chicago Rawhide Manufacturing Co.*, 223 USPQ 351 (Board of Appeals 1984). As stated in *In re Fine* at 5 USPQ2d 1598:

"The PTO has the burden under section 103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that

individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

* * * * *

"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

* * * * *

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie

case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd.Pat.App.& Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. The rationale urged in the explanation of the rejection, "to form a hard, smooth thread", is not persuasive in view of the fact that the proposed substitution would render Beery inoperable, and having a hard, smooth thread will not overcome the inoperability. Certainly to make a substitution leading to inoperability is not a desirable combination.

The proposed combination takes into account information other than that which was within the level of ordinary skill in the art, as it is based entirely upon knowledge gleaned from Applicant's disclosure. This attempted combination of teachings requires a decision as to the structure of the rotating screw in the modified form of Beery's device. Beery requires an asymmetric thread structure that could not be constructed with a round wound wire as in Devenyi. Devenyi's bidirectional device could not function with the asymmetric rotating screw of Beery. The determination to substitute Devenyi's wire-wound thread structure into the device of Beery, which renders the device of Beery inoperable, is based solely on an attempt to re-create in hindsight the present invention and is therefore based solely upon Applicant's disclosure.

Claims 10, 12-13, and 20

Applicant incorporates the discussion of the rejection of claim 1, because the rejection of claims 10, 12-13, and 20 suffers from the same problems as the rejection of claim 1.

Additionally, each of claims 10, 12-13, and 20 recites in part:

"a linear slide mechanism to which the drive nut housing is affixed so that the drive nut housing does not rotate"

Beery has no such teaching. In fact, Beery specifically requires that the sectional housing 12 rotate about the screw (col. 2, lines 34-42). It is a well-established principle of law that a *prima facie* case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)...As "a useful general rule,"..."a reference that 'teaches away' can not create a *prima facie* case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)"

In this case, Beery requires a rotatable sectional housing 12 for its device to function. The use of such a rotatable sectional housing is directly contrary to the limitation recited above from claims 10, 12-13, and 20, and Beery therefore may not be used as a reference to reject these claims.

If Beery is used as a reference, then there must be some teaching supporting the substitution of a non-rotating housing for the rotatable sectional housing 12 of Beery. In that case, the device of Beery becomes inoperable, and it seems unlikely that such a teaching will be found.

Ground 2. Claims 8 and 14 are rejected under 35 USC 103 over Beery in view of Devenyi '549 and further in view of Devenyi US Patent 5,533,417.

Claim 8

Claim 8 depends from claim 1. Applicant incorporates the discussion of claim 1 from the above section dealing with the Ground 1 rejection.

Additionally, claim 8 recites in part:

"the drive nut housing has an access opening therethrough, through which the spring pin is accessible from an exterior of the drive nut housing and providing clearance for the spring pin"

The rationale of the explanation of the rejection for placing an access opening into Beery is that "an access opening ...allows for assembly of internal components that is easier..." Applicant must respectfully disagree. Beery describes a different way of assembly of the internal components. Beery teaches that his device is constructed as two annular bearing sections 30 that sandwich the spring retaining sections 28 between them. The stack is held together by axially extending fasteners 36. See. col. 3, lines 9-13 and Fig. 4 of Beery. The spring 10 is assembled into the spring retaining sections 28, and then the spring retaining sections 28 are sandwiched between the bearing sections 30 and fastened into place with the fasteners 36. There is no reason to change this disclosed approach of Beery. Placing an access opening into the spring retaining sections 28 would not make assembly any easier. If some of the teachings of Devenyi '417 are to be used, then they should all be used so that the spring 10 of Beery is replaced by the bearing structures 16 and 18 of Devenyi as well. Devenyi '417 provides the access opening so that this bearing structure as seen in Figure 3 can be assembled, so that this teaching must be incorporated as well if the access opening teaching is used--that's why there is an access opening.

The argument regarding assembly is pure hindsight. Beery describes his

approach for assembly, which is unaffected by the presence or absence of an access opening. The argument of the rationale for the access opening presupposes that the assembly approach of Beery is to be changed, and there is no basis for that position. Like much of the rest of the rationale for combining the teachings of the references, the argument regarding the access opening is pure hindsight and is contrary to the express teachings of Beery.

Claim 14

Claim 14 depends from claim 12. Applicant incorporates the discussion of claim 12 from the above section dealing with the Ground 1 rejection.

Additionally, claim 8 recites in part:

"the drive nut housing has an access opening therethrough, through which the spring pin is accessible from an exterior of the drive nut housing and providing clearance for the spring pin"

Applicant incorporates the discussion of this limitation from the preceding section dealing with the rejection of claim 8.

Ground 3. Claims 11, 17, and 21 are rejected under 35 USC 103 over Beery in view of Devenyi '549, and further in view of Pan US patent 6,459,844.

Claims 11 and 21

Claims 11 and 21 depends from claim 1. Applicant incorporates the discussion of claim 1 from the above section Ground 1.

Additionally, each of claims 11 and 21 recites in part:

"an optical filter supported on the linear slide mechanism, the

optical filter being movable by a rotation of the leadscrew"

Pan teaches a leadscrew structure that achieves bidirectional movement of a filter 12.

If one attached an optical filter to the biasing member 52 of Beery, there would be several practical problems. First, the optical filter would be driven only in one direction (i.e., toward the feed roller 58) by the motor 64, contrary to the teachings of Pan. Second, to move the optical filter in the other direction (away from the feed roller 58), it would be necessary to manually disengage the spring member 10 from the screw 16 by rotating the biasing member 52 to the disengaged position as in Figure 1 of Beery, and then manually move the biasing member 52 and the optical filter away from the feed roller 58 in that position. Third, the optical filter would not be operable in the desired manner described by Pan when it and the biasing member 52 were moved away from the feed roller 58 in this rotated, manual manner. Fourth, to re-engage the spring 10 to the screw 16 and render the optical filter operable in the manner described in Pan, it would be necessary to manually rotate the biasing member 52 to the position shown in Figure 3 of Beery. Fifth, the positioning of the optical filter would be less accurate than in Pan, because of the manual repositioning each time a reversal in movement was accomplished. It is really difficult to imagine that "one of ordinary skill" would have made this substitution.

Claim 17

Claim 17 depends from claim 12. Applicant incorporates the discussion of claim 12 from the above section Ground 1.

Additionally, claim 17 recites in part:

"an optical filter supported on the linear slide mechanism, the optical filter being movable by a rotation of the leadscrew"

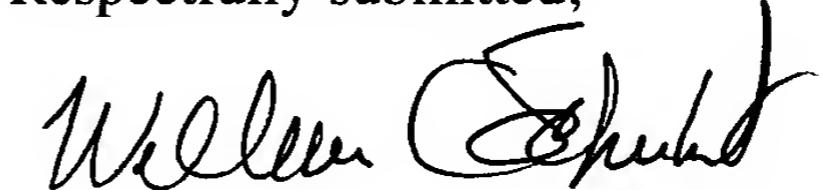
Applicant incorporates the discussion of this limitation from the preceding section dealing with the rejection of claims 11 and 21.

SUMMARY AND CONCLUSION

The combination of teachings of Beery and Devenyi '549 underlies all of the rejections. The attempt to combine the teachings of these two references is contrary to law because the proposed combination if inoperable and unsuitable for its intended purpose. Beery absolutely requires an asymmetric profile screw and a rotatable split housing to function, and Devenyi '549 teaches a screw structure that necessarily has a symmetric profile. The proposed substitution of the round wire screw of Devenyi '549 into the structure of Beery would render the device of Beery inoperable and unsuitable for its intended purpose. The use of a non-rotating follower housing would also render the device of Beery inoperable and unsuitable for its intended purpose.

The selective use of only certain teachings of Beery, the Devenyi references, and Pan, while ignoring the contrary teachings, is pure hindsight reconstruction that relies only on Applicant's disclosure.

Respectfully submitted,



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APPENDIX
Clean Copy of Appealed Claims

1. A leadscrew assembly comprising:
 - a leadscrew comprising
 - an elongated shaft having an outer lateral surface and a rotational axis,
 - and
 - a leadscrew thread comprising a thread wire helically wrapped in spaced-apart turns upon the lateral surface and affixed to the elongated shaft; and
 - a hollow drive nut housing comprising
 - a nut bore having an unthreaded inner surface with the leadscrew being inserted through the nut bore, the nut bore being sized such that the leadscrew may rotate therein about the rotational axis, and
 - a spring pin affixed to the drive nut housing and spanning across the nut bore to engage the leadscrew thread.
2. The assembly of claim 1, wherein the leadscrew further comprises a spacer wire having a size smaller than that of the thread wire and helically interwrapped about the elongated shaft with the thread wire.
3. The assembly of claim 1, wherein the elongated shaft is cylindrical.
4. The assembly of claim 1, wherein thread wire has a circular cross section.
5. The assembly of claim 1, wherein the spring pin has a first end and a second end, and wherein the first end and the second end are each affixed to the drive nut housing.
6. The assembly of claim 1,

wherein the spring pin has a first end, a central portion, and a second end, and wherein the drive nut housing comprises a first spring pin retainer and an oppositely disposed second spring pin retainer, the first spring pin retainer having the first end of the spring pin affixed thereto and the second spring pin retainer having the second end of the spring pin affixed thereto, with the central portion of the spring pin spanning in an arc across an interior of the nut bore to engage the leadscrew thread.

7. The assembly of claim 6, wherein the first spring pin retainer and the second spring pin retainer each comprise openings in the drive nut housing.

8. The assembly of claim 1, wherein the drive nut housing has an access opening therethrough, through which the spring pin is accessible from an exterior of the drive nut housing and providing clearance for the spring pin.

9. The assembly of claim 1, further including a motor that rotationally drives the leadscrew.

10. The assembly of claim 1, further including a linear slide mechanism to which the drive nut housing is affixed so that the drive nut housing does not rotate.

11. The assembly of claim 10, further including an optical filter supported on the linear slide mechanism, the optical filter being movable by a rotation of the leadscrew.

12. A leadscrew assembly comprising:
a leadscrew comprising
a cylindrical shaft having an outer lateral surface and a cylindrical axis coincident with a rotational axis of the leadscrew,
a leadscrew thread comprising a thread wire helically wrapped in spaced-

apart turns upon the lateral surface and affixed to the elongated shaft, the thread wire having a circular cross section, and

a spacer wire having a size smaller than that of the thread wire and helically interwrapped about the elongated shaft with the thread wire to define a spacing between the turns of the thread wire; and

a hollow drive nut housing comprising

a nut bore having an unthreaded inner surface with the leadscrew being inserted through the nut bore, the nut bore being sized such that the leadscrew may rotate therein about the rotational axis, and

a spring pin affixed to the drive nut housing and spanning across the nut bore to engage the leadscrew thread,

wherein the spring pin has a first end, a central portion, and a second end, and

wherein the drive nut housing has a first spring pin retainer therein and an oppositely disposed second spring pin retainer therein, the first spring pin retainer receiving the first end of the spring pin therein and the second spring pin retainer receiving the second end of the spring pin therein, with the central portion of the spring pin spanning in an arc across an interior of the nut bore to engage the leadscrew thread over a portion of a single turn; and

a linear slide mechanism to which the drive nut housing is affixed so that the drive nut housing does not rotate.

13. The assembly of claim 12, wherein the first spring pin retainer and the second spring pin retainer each comprise openings in the drive nut housing.

14. The assembly of claim 12, wherein the drive nut housing has an access opening therethrough, through which the spring pin is accessible from an exterior of the drive nut housing and providing clearance for the spring pin.

15. The assembly of claim 12, further including

a motor that rotationally drives the leadscrew about the rotational axis.

17. The assembly of claim 12, further including
an optical filter supported on the linear slide mechanism, the optical filter being
movable by a rotation of the leadscrew.

18. The assembly of claim 1, wherein
the spring pin contacts the leadscrew thread over a portion of a single turn.

19. The assembly of claim 1, wherein the spring pin is preloaded to ensure
a positive contact between the spring pin and the leadscrew thread when a rotational
direction of the leadscrew is reversed.

20. A leadscrew assembly comprising:
a leadscrew comprising
an elongated shaft having an outer lateral surface and a rotational axis,
and
a leadscrew thread comprising a thread wire helically wrapped in spaced-apart turns upon the lateral surface and affixed to the elongated shaft;
a hollow drive nut housing comprising
a nut bore having an unthreaded inner surface with the leadscrew being
inserted through the nut bore, the nut bore being sized such that the leadscrew may
rotate therein about the rotational axis, and
a spring pin affixed to the drive nut housing and spanning across the nut
bore to engage the leadscrew thread over a portion of a single turn of the leadscrew
thread; and
a linear slide mechanism to which the drive nut housing is affixed so that the
drive nut housing does not rotate.

21. The assembly of claim 19, further including

an optical filter supported on the linear slide mechanism, the optical filter being movable by a rotation of the leadscrew.